Since 1881 a new aspect of affairs has appeared through the wine industry. The culture of the vine, after some partial failures on account of lack of experience with the different climatic and other conditions, is now an undoubted success; and it comes just at a time when the vine-growers in the south of France are beginning to despair of conquering the insect pests which are destroying their vines. Accordingly, large numbers of them have emigrated, and their capital and good-will have given a large impetus to the French colonization of Algeria. It is also found that the olive flourishes exceedingly well, and the prospect for the financial success of the colony is at last brighter. The government has spent, from first to last, an enormous sum of money upon Algeria; the railways, roads and other conveniences for travelling are in better condition than in Italy; and with the present good outlook in wine, oil and grain growing, it appears as if Algeria were to have an important future. Whether France will ever reap the result of her efforts there, or some other nation step in in her place, or even an independent state arise there, time alone will tell.

RECENT GRAVITY DETERMINATIONS IN AND NEAR JAPAN.

IN the year 1880 Professor Mendenhall, then professor of physics in the University of Tokio, made a determination of the force of gravity at that place, using a 'Borda's pendulum,' and comparing its measuring-rod with a meter, in the possession of the Japanese treasury department, which was a certified copy of the standard at the Conservatoire des arts et metiers. The determination was thus an absolute one, and, from the circumstances under which it was made, it would seem probable that the resulting value of g, 9.7984m, must be very near the truth. This is very slightly in excess of the values given by the formulæ generally accepted as best representing g for any latitude, as deduced from a large number of determinations on different parts of the globe.

Since 1880 several of Professor Mendenhall's pupils, in the department of physics (notably Mr. Tanakadate, now assistant to the professor of physics), have made determinations of g at four places in and near Japan, swinging two or three 'invariable' pendulums, in each case first at Tokio, then at the station in question, and again at Tokio, and they furnish very accurate relative values of the force of gravity at all these places. The results have been published in a series of three appendices to No. 5 of the *Memoirs of the science department of Tokio daigaku*, which contained Professor Mendenhall's work.

The most recent one is of unusual interest, for in it is the result of a determination of g at the Bonin islands, which lie out in the Pacific five or six hundred miles south-east of the coast of Japan, and which have for a half-century been of note among geodęsists, as the place where the force of gravity is most in excess of the normal value of any thus far observed.

In the years 1826–9 Captain Leutke, in command of a Russian expedition, visited these islands and determined the value of g to be about 0.0025m larger than the normal value, which will be, perhaps, better appreciated by saying that it indicated that a seconds-pendulum would vibrate there about 11 sec. per day faster than at the same latitude in most parts of the earth. This value has always been considered as abnormal, and generally left out in any discussion of the figure of the earth from gravity determinations. The interest attaching to the last determination by Mr. Tanakadate lies in the fact that, if Professor Mendenhall's value of g for Tokio is nearly correct, then at present it is even more in excess at the Bonin islands than deduced by Captain Leutke; the last result giving about 0.0034m over the normal value of g, or a gain 15 sec. per day in a seconds-pendulum.

The whole result of the measurements on this part of the globe, thus far published, is best shown in the following table, which shows the date, place, latitude, observers, and the correction which the observations give to the value of g, as deduced from the mean of Everett's, Listing's and Herschel's formulæ which are closely accordant. In the final column is the corresponding gain in seconds per day, of a pendulum, which, with the normal value of g given by the formulæ, would vibrate 86,400 times per day at each place.

Date.	Place.	Latitude.	Observers.	Excess of gravity.	
		° ′		m.	sec.
1826–9	Ogasawarajima, Bonin Islands.	+27 4	Leutke	+0.0025	+10.9
1880	Tokio, Nippon.	+35 41	Mendenhall	+0.0003	+ 1.3
1881	Sapporo, Yesso.	+43 4	Tanakadate, Fujisawa and Tanaka	+0.0007	+ 3.1
1882	Kagoshima, Kiu-shiu.	+31 25	Tanakadate, Sakai and Yamaguchi	+0.0007	+ 3.1
1882	Naha, Liu-kiu Islands.	+26 12	Tanakadate, Sakai and Yamaguchi	+0.0010	+ 4.4
1884	Ogasawarajima, Bonin Islands.	+27 4	Tanakadate and Sawai	+0.0034	+14.9

Mr. Edwin Smith, of the coast survey, and Professor H. S. Pritchett, of the Washington univer-

sity, St. Louis, who constituted the transit-of-Venus party in New Zealand in 1882, carried on, under the auspices of the coast survey, a series of gravity determinations after the transit of Venus was over, swinging pendulums—the same that had been used by Major Herschel in India, England and America—in New Zealand and Australia, at Singapore, Tokio, San Francisco and Washington.

This series served the valuable purpose of connecting together, differentially, several independent systems of gravity determinations, and when finally reduced may slightly change Professor Mendenhall's Tokio value, but is not likely to alter it materially. It is of some importance to note that, of the determinations in the vicinity of Japan, the excess at Tokio is the smallest; those at Sapporo and Kagoshima, near the northern and southern extremities of the principal Japanese islands, come next; that at Naha, out in the ocean off the Chinese coast, is still larger; while the Bonin islands, well out in the Pacific, give the greatest excess yet observed. The value coming nearest to this was also determined by Captain Leutke at Ualan, one of the most south-eastern of the Caroline group of islands, and about 5° north of the equator. It would certainly be well to re-occupy this and others of Captain Leutke's stations, in order to determine whether these abnormal values of g may be actually increasing in the Pacific.

The eclipse party, under Professor Holden, to Caroline island, 10° south of the equator and in mid-Pacific, also made, under the auspices of the coast survey, pendulum observations there, and at Honolulu and San Francisco. These results, together with those of Messrs. Smith and Pritchett will be awaited with interest.

The more we study our globe the more irregular do we find it in figure and density; and it is evident that such work as that inaugurated by Professor Mendenhall at Tokio, and that prosecuted of late years by the coast survey in all parts of the globe—where it could be economically done in connection with other necessary scientific work—is among the most important of modern contributions to our knowledge of the figure and dimensions of the earth, and is a class of work which must be carried out in connection with triangulation and astronomical determinations of latitude and longitude, before we can be at all sure that we know with sufficient precision the average value of the earth's radius, which is the unit of length or base line from which we strike out from the earth into celestial spaces, and upon which all our values of planetary and stellar distances depend.

H. M. PAUL.

GEOLOGICAL CHANGES IN NEW SOUTH WALES.[1]

From the close of the Pleistocene period to present times the main physical features of New South Wales have remained pretty constant. In the Carboniferous period a large part of the country was a stretch of ocean, the New England mountains being but little older. The last main elevation occurred early in Mesozoic times, and from that time to the Pleistocene period unceasing atmospheric denuding, faultings and volcanic eruptions have been at work shaping the country into valleys and hills. The Pleistocene deposits are indicated by vast accumulations of drift and diluvial sediment derived from the erosion of the deep valleys in the highlands when the rainfall was greater than at present. That the rainfall in this period was much greater than it has since been is proved by the evidence of great erosion in the highlands.

The cause of this interesting pluvial period over a large portion of the southern hemisphere—for its effects have been observed in New Zealand, South America and South Africa—is directly connected with the Glacial period of the northern hemisphere. While the northern winter was so long and cold as to induce a large accumulation of snow and ice, that of the opposite hemisphere was short and mild with long and cool summers. There was a perpetual spring in the southern lands. When the alternation took place, 10,500 years after, the Antarctic ice was so extended as to produce on a larger scale and nearer to the Australian continent, the fogs, rain and snowstorms which now prevail in the Antarctic ocean. The present glaciated condition of the Antarctic regions being due to the winter of the southern hemisphere being in aphelion, it may readily be perceived how these conditions must have been intensified in the Pleistocene period when the eccentricity was three and a half times greater than it now is. It is also thought that owing to the extreme difference between the temperature of the south pole and that of the tropics, the south-east trade winds would blow with a greater force over a larger area, and so the upper counter trades would return more heavily laden with moisture.

In the highest Australian mountain, Mount Kosciusko, Dr. R. von Lendenfeld has recently found proof of former glacial action. Traces of glacial action were not seen lower than 5,800 feet above the sea, and they did not cover an area of more than 150 square miles. No glaciers exist there now; but patches of snow lie on the sheltered slopes and never disappear. It is interesting

[1] Extract from President C. S. Wilkinson's address before the annual meeting of the Linnæan society of New South Wales, January 28, 1885.